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Claims

1. A method for the treatment of soft tissue disease in a mammalian subject, said method comprising administering to said subject a therapeutically effective quantity of a soft tissue targeting complex of thorium-227 and a complexing agent, wherein said quantity is such that an acceptably non-myelotoxic quantity of radium-223 is generated *in vivo* by nuclear decay of the administered thorium-227 wherein the thorium-227 is conjugated to a targeting moiety with bioaffinity, excluding bone-seekers, liposomes and folate conjugated antibodies or antibody fragments and wherein the therapeutically effective quantity of thorium-227 is at least 25 kBq/kg.

2. A method as claimed in claim 1 wherein said subject is human or canine.

3. A method as claimed in any one of claims 1 to 3 wherein said therapeutically effective quantity is at least 75 kBq of thorium-227 per kilogram bodyweight.

4. A method as claimed in any of claims 1 to 3 wherein said acceptably non-myelotoxic quantity is less than 300 kBq radium-223 per kilogram bodyweight.

5. A method as claimed in claim 4 wherein said acceptably non-myelotoxic is less than 150 kBq of radium-223 per kilogram bodyweight.

6. A method as claimed in any of claims 1 to 5 wherein said complex comprises chelated thorium-227 linked to a ligand selected from the group of antibodies, antibody constructs, antibody fragments, constructs of antibody fragments and mixtures thereof.

7. A method as claimed in any of claims 1 to 6 wherein said soft tissue disease is a malignant disease.

8. A method as claimed in claim 7 wherein the malignant disease is a disease selected from the group of carcinomas, sarcomas, myelomas, lukemias, lymphomas and mixed type cancers.

9. A method as claimed in any of claims 1 to 8 wherein said subject is also treated to combat the myelotoxicity of the radium-223 generated therein.

10. A method as claimed in claim 9 wherein said subject is provided with stem cell treatment.

11 A method for the treatment of soft tissue disease in a mammalian subject, said method comprising administering to said subject a therapeutically effective quantity of a soft tissue targeting complex of thorium-227 and a complexing agent, wherein said quantity is D_{add} as calculated from formula I below, such that an acceptably non-myelotoxic quantity D_{Ra} of radium-223 is generated *in vivo* by nuclear decay of the administered thorium-227;

$$D_{add} = \frac{D_{Ra} \times T_{Th}\left((T_{Bio})^{-1} + (T_{Th})^{-1}\right)}{1.65} \qquad (I)$$

wherein:

T_{Bio} is the biological half-life of said soft tissue targeting complex of thorium-227 and a complexing agent;

T_{Th} is the physical half-life of ^{227}Th (18.7 days);

D_{add} is the activity of the administered ^{227}Th complex (kBq/kg) and is is at least 25 kBq/kg; and

D_{Ra} is the acceptably non-myelotoxic amount of ^{223}Ra;

and further, wherein the thorium-227 is conjugated to a targeting moiety with bioaffinity, excluding bone-seekers, liposomes and folate conjugated antibodies or antibody fragments.

12 A method as claimed in claim 11 wherein D_{Ra} is 200 kBq/kg

13. A method as claimed in any of claims 1 to 12 in combination with at least one further treatment modality selected from surgery, external beam radiation therapy, chemotherapy, endoradionuclide therapy with radionuclides other than ^{227}Th, and/or tissue temperature adjustment.

14. A pharmaceutical composition comprising a soft tissue targeting complex of thorium-227 and a complexing agent, together with at least one pharmaceutical carrier or excipient wherein the thorium-227 is conjugated to a targeting moiety with bioaffinity, excluding bone-seekers, liposomes and folate conjugated antibodies or antibody fragments and wherein the thorium-227 is present at a therapeutically effective quantity of at least 25 kBq/kg.

15. A soft tissue targeting complex of thorium-227 and a complexing agent wherein the thorium-227 is conjugated to a targeting moiety with bioaffinity, excluding bone-seekers, liposomes and folate conjugated antibodies or antibody fragments.

16. A complex as claimed in claim 15 wherein thorium-227 is chelated by a derivative of 1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic acid.

17. A method for forming a complex as claimed in claim 16 comprising heating said thorium-227 with said derivative of 1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic acid to form a chelated thorium-227 and subsequently attaching said chelated thorium-227 to a targeting moiety.

18. A kit for use in a method as claimed in any of claims 1 to 13, said kit comprising a solution of a soft tissue targeting complex of thorium-227 and a complexing agent together with instructions for the use of said solution in said method wherein the thorium-227 is conjugated to a targeting moiety with bioaffinity, excluding bone-seekers, liposomes and folate conjugated antibodies or antibody fragments.

20. A kit for use in a method as claimed in any of claims 1 to 13, said kit comprising a complexing agent capable of complexing thorium ions; where said complexing agent is not a soft tissue targeting complexing agent, a soft tissue targeting compound, optionally together with a linker compound, conjugatable to said complexing agent to yield a soft tissue targeting complexing agent; and instructions for the preparation therefrom of a soft tissue targeting complex of thorium-227 and a complexing agent, and optionally also for the use of said complex in said method wherein the soft tissue targeting complex is a moiety with bioaffinity, excluding bone-seekers, liposomes and folate conjugated antibodies or antibody fragments.